

10/4/17

"What you do today can improve all your tomorrows"-Ralph Marston

HW: "Fractional Exponents" back #38, 43, 48, 54, 59, 61, 64, 67, 71, 75, 78

Aim: What do Fractional Exponents tell us?

Warm Up:

Flip the fraction
Switch the sign of exponent

Simplify:

$$\left(\frac{x^3}{y^2}\right)^{-1} = \left(\frac{y^2}{x^3}\right)^1 = \frac{y^2}{x^3}$$

$$4) 2x^3 \cdot 2x^2 = \boxed{4x^5}$$

$$6) \frac{x^4}{x^7} = \boxed{\frac{1}{x^3}} \text{ (Battle, who wins?)}$$

$$8) -(9x)^0 = -(1) = \boxed{-1}$$

$$14) (2fg^4)^4 (fg)^6$$

$$(2^4 \cdot f^4 g^{4 \cdot 4}) (f^6 g^6)$$

$$(16f^4 g^{16}) (f^6 g^6) = \boxed{16f^{10} g^{22}}$$

$$18) \left(\frac{5x^3y}{20xy^5} \right)^4 = \left(\frac{x^2}{4y^4} \right)^4$$

$$= \frac{x^{2 \cdot 4}}{4^4 y^{4 \cdot 4}} = \boxed{\frac{x^8}{256y^{16}}}$$

$$20) 7^{-2} = \frac{1}{7^2} = \boxed{\frac{1}{49}}$$

$$22) \frac{1}{2^{-4}} = \frac{2^4}{1} = \boxed{16}$$

$$27) \frac{x^{-1}}{x^{-8}} = \boxed{\frac{x^7}{1}} \text{ Battle, who wins? } \frac{x^5}{x^3} = \frac{\cancel{x} \cancel{x} \cancel{x} \cancel{x} \cancel{x}}{\cancel{x} \cancel{x} \cancel{x}} = \boxed{x^2}$$

$$35) (4x^4y^{-4})^3 = 4^3 x^{4 \cdot 3} y^{-4 \cdot 3}$$

$$= 64x^{12}y^{-12}$$

$$= \boxed{\frac{64x^{12}}{y^{12}}}$$

$$38) \left(\frac{-2a^3b^2c^0}{3a^2b^3c^7} \right)^{-2} = \left(\frac{-2a}{3bc^7} \right)^{-2}$$

$$= \left(\frac{3bc^7}{-2a} \right)^2 = \frac{3^2 b^2 c^{7 \cdot 2}}{(-2)^2 a^2}$$

$$= \boxed{\frac{9b^2c^{14}}{4a^2}}$$

If $x \geq 0$ and n is a positive integer then:

$$(1) \quad x^{\frac{1}{n}} = \sqrt[n]{x} \quad \quad \quad \sqrt[3]{x} = x^{\frac{1}{3}}$$

$$(2) \quad x^{\frac{m}{n}} = (\sqrt[n]{x})^m = \sqrt[n]{x^m}$$

★ Think: $\frac{\text{Power}}{\text{Root}}$

$$(3) \quad \frac{x^{-\frac{m}{n}}}{1} = \frac{1}{(\sqrt[n]{x})^m} = \frac{1}{\sqrt[n]{x^m}}, \quad x \neq 0$$

(Handwritten red annotations: A red arrow points from the denominator $(\sqrt[n]{x})^m$ to the fraction $\frac{1}{x^{\frac{m}{n}}}$ below. The expression $\frac{1}{x^{\frac{m}{n}}}$ is written in red below the main equation.)

$$\begin{aligned} 1) \ 256^{\frac{1}{2}} &= \sqrt[2]{256} \\ &= \sqrt{256} \\ &= 16 \end{aligned}$$

$$\begin{aligned} 2) \ 8^{\frac{1}{3}} &= \sqrt[3]{8} \\ &= \sqrt[3]{8} \\ &= \boxed{2} \end{aligned}$$

$$5) \ 32^{-\frac{2}{5}} = \frac{1}{32^{\frac{2}{5}}} = \boxed{\frac{1}{\sqrt[5]{32^2}}}$$

$$\begin{aligned} 8) \ a) \ (-27)^{\frac{1}{3}} &= \sqrt[3]{-27} \\ &= \boxed{-3} \end{aligned}$$

$$\begin{aligned} b) \ -27^{\frac{1}{3}} \\ (-1) 27^{\frac{1}{3}} &= -1 \sqrt[3]{27} \\ &= -1(3) \\ &= \boxed{-3} \end{aligned}$$

Rewrite each of the following using Rational Exponents:

$$10a) 5\sqrt{x} = 5x^{\frac{1}{2}}$$

$$10b) \sqrt[3]{5x^2} = (5x^2)^{\frac{1}{3}} = 5^{\frac{1}{3}} x^{2 \cdot \frac{1}{3}} = 5^{\frac{1}{3}} x^{\frac{2}{3}}$$

$$10c) \sqrt[3]{(5x)^2} = (5x)^{\frac{2}{3}} = 5^{\frac{2}{3}} x^{\frac{2}{3}}$$

$$10d) \sqrt[5]{x^4 y^3} = (x^4 y^3)^{\frac{1}{5}} = x^{\frac{4}{5}} y^{\frac{3}{5}}$$